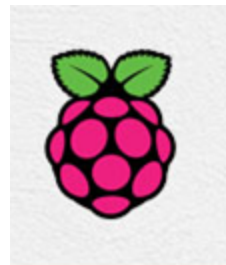


Raspberry Pi



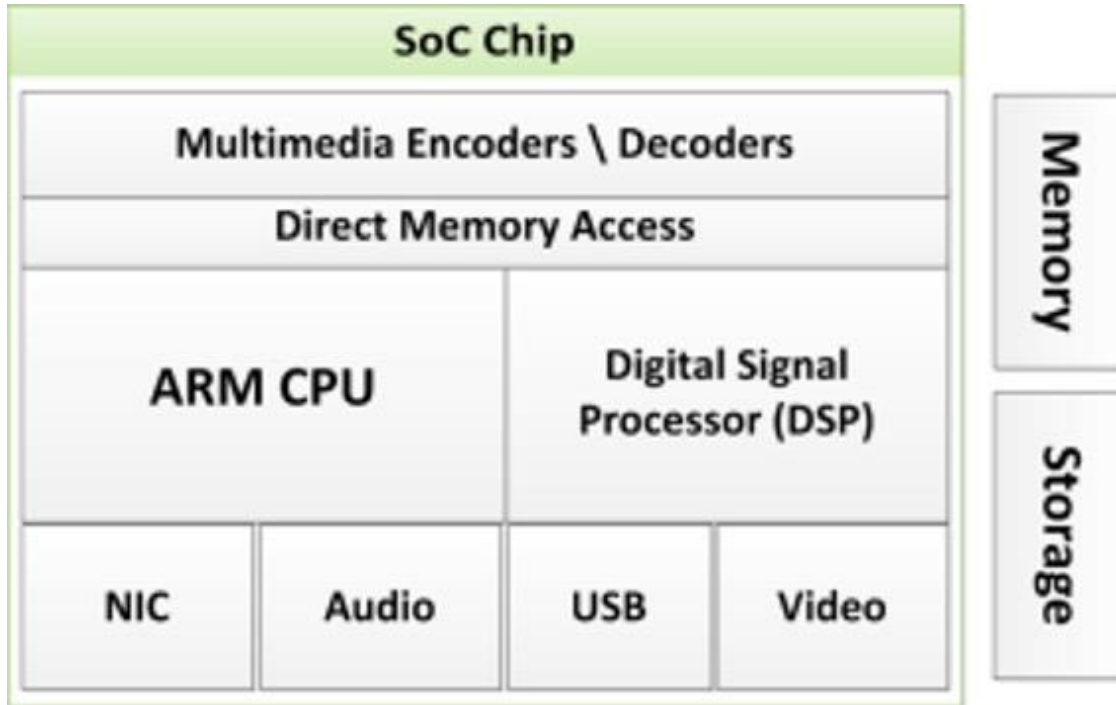
- Introduction to Raspberry Pi,
- Understanding SoC architecture and
- SoCs used in Raspberry Pi,
- Pin Description of Raspberry Pi,
- On-board components of Rpi

- Raspberry Pi is a series of small single-board computers developed in the UK by the Raspberry Pi Foundation with the aim of promoting teaching of basic computer science in schools and in developing countries.

Architecture of SoC

- SoC stands for **System On Chip**.
- It is a **small integrated chip** that contains all the required components and circuits of a particular system.
- The components of SoC include **CPU, GPU, Memory, I/O devices**, etc.
- SoC is used in various devices such as **smartphones, Internet of Things appliances, tablets, and embedded system applications**.

Architecture of SOC



Processor: It is the heart of SoC, usually SoC contains at least **one or more than one coprocessor**. It can be a microcontroller, microprocessor, or DSP. Most of the time DSP is used in every SoC as a processor.

DSP: DSP stands for **Digital Signal Processor**. It is included in SoC to perform signal processing operations such as **data collection, data processing, etc.** it is also used for the purpose of **decoding the images**.

Memory: Memory is used in SoC for the purpose of **storage**. It may be a **volatile or non-volatile memory**. Volatile memory includes RAM there are two types of RAM one is **SRAM and another is DRAM**. The non-volatile memory includes **ROM**.

Volatile Memory is used to store real-time computer programs and data that the CPU requires, and it is **wiped once the machine is turned off**.

Non-volatile memory, on the other hand, is permanent and stays in the computer even after it is **turned off**.

Encoder/Decoder: Used for the purpose of interrupting information and converting it into codes.

Network Interface card: SoC has an internal interface or bus or network to connect all individual blocks. Basically, the Network interface card provides a connection of the network to the system.

GPU: GPU stands for Graphical Processing Unit, used in SoC to visualize the interface. GPU is specially designed to speed up the operations related to image calculations. The basic blocks of the GPU are the Bus interface, Power Management Unit, Video Processing unit, Graphics Memory Controller, Display interface, etc.

Peripheral devices: Externally connected devices/interfaces such as USB, HDMI, Wi-Fi, and Bluetooth are included in peripheral devices. This device is used in SoC to perform various operations.

UART: Universal Asynchronous Receiver Transmitter is included in SoC which is used to transmit or receive serial data. Voltage regulators, Oscillators, clocks, and ADC/DAC are also part of SoC.

Advantages of SoC:

- It is small in size and includes many features and functions.
- It consumes low power.
- SoC is flexible in terms of size, and power factor.
- It is built on a single chip.
- It is cost-effective.
- It is produced in a large quantity.

Disadvantages of SoC:

- Time-consuming designing process. Usually, a designing process of SoC takes six to twelve months.
- If any component of the SoC is not functioning properly then it cannot be replaced in that case an entire SoC has to be replaced.

Uses of SoC:

- Used in smartphones, smartwatches, tablets, and computers.
- Internet of Things applications such as home automation.
- Embedded systems applications especially where the microcontroller is used.

- Single-Board Computer (SBC)
- A **Single-Board Computer (SBC)** is a complete, functioning computer in which the microprocessor, input/output functions, memory, and other features are **all built on a single circuit board**, with RAM built in at a pre-determined amount and with no expansion slots for peripherals.
- The Single-Board Computer (SBC) is a **preferred embedded controller for a wide range of industries, having consumer, industrial, smart home, automotive, appliance, medical, commercial, and military applications**
- The **Raspberry Pi is a series of small Single-Board Computers (SBCs)** that launched in **2012** and has gained popularity throughout the years, such as the Raspberry Pi 4.
- Raspberry Pi, developed by **Raspberry Pi Foundation in association with Broadcom**, is a series of small single-board computers and perhaps the most inspiring computer available today.
- It is **widely used to make gaming devices, fitness gadgets, weather stations, and much more**. But apart from that, it is used by thousands of people of all ages who want to take their first step in computer science.

Generations and Models

In 2012, the company launched the Raspberry Pi and the current generations of regular Raspberry Pi boards are Zero, 1, 2, 3, and 4.

Generation 1 Raspberry Pi had the following four options –

- Model A

- Model A +

- Model B

- Model B +

Thank you